Field of the invention

The invention relates to equipment for receiving a weapon, especially a small-calibre weapon, for a test bench, especially a small-arm or a long weapon which has a complicated shape or which can be dismantled, and this equipment comprises a mount provided with receiving means for securing the weapon.

Technological background

According to document FR 92 05 643, there is already a test bench for small-calibre weapons. This test bench is suitable above all for long weapons or hip weapons that provide gripping regions enabling the weapon to be fastened in the equipment. However, this fastening is practically impossible in the case of small-arms and for some long weapons that have a complicated shape or that can be dismantled because it is not possible rapidly to install such a weapon in a fastening stirrup comprising fastening screws which clamp the weapon from opposite sides and keep it locked in position.

Object and advantages of the invention

In order to overcome those disadvantages, the present invention proposes to develop equipment enabling a small-calibre weapon, such as a small-arm or a special-form gun, to be secured, ensuring the reliability of the shots fired and at the same time simplifying installation and enabling a weapon to be mounted / dismounted rapidly in the case of tests on series of weapons so that these tests can be carried out as rapidly and efficiently as possible.

To that end, the invention relates to equipment for receiving a weapon of the type defined above, characterised in that it comprises

- a receiving means provided with clamping screws for receiving and locking in position the weapon to be tested,
- a positioning means carried by the receiving means,
- an interface moulded on the weapon and the positioning means,

- the clamping screws connected to the receiving means and clamping the moulded interface against the weapon.

Owing to the interface moulded on the weapon and the positioning means, precise and repeatable locking is obtained for the weapon relative to the positioning means, even for weapons that are difficult, or even impossible, to fasten with conventional means owing to the irregularity of their shape or the very reduced possibilities for fastening in a conventional test bench. Thus, the equipment according to the invention enables a small-arm to be fastened in a stable manner by its butt without any risk that the weapon will be displaced relative to the receiving means under the effect of impact and vibration as each shot is fired. Despite this efficient locking in position by the butt, the base of the butt remains accessible for a change of magazine. This enables firing precision to be considerably improved and enables the influence of the test bench on the result to be reduced.

In a particularly practical manner, the moulded interface is composed of thermoformable plastics material. It is necessary only to heat a mass of plastics material, for example in the form of granules, to the softening temperature and then to remove the mass from the heat source, for example a tank containing heated water, in order to envelop the butt of the small-arm over a portion of its periphery and place the weapon so coated with its mass of plastics material between the positioning means and then to tighten the clamping screws and allow cooling to take place. The result is a precise mould for receiving the butt of the weapon, and also precise positioning because the mould is marked by the grooves of the positioning means.

According to one advantageous feature, the equipment intended for a small-arm is characterised in that

- the receiving means is a seat which is secured to the mount of the test bench,
- the positioning means is constituted by two grooved plates which are connected by clamping screws which extend through them and which are fastened to the seat,
- the grooved surfaces of the plates being turned towards one another in order to receive between them the interface moulded on the weapon.

It is advantageous if the equipment comprises positioning members in addition to the clamping screws and if the grooves of the channels are distributed in a grid pattern.

The invention relates also to equipment of the type defined above that is applicable to a long weapon or a hip weapon. This equipment is then characterised in that

- the receiving means is a U-shaped stirrup provided with positioning means constituted by imprint-marking screws screwed into the U-shaped stirrup and extending through the latter in a limited manner in order to project into the housing of the U-shaped stirrup,
- these imprint-marking screws being replaced by clamping screws which clamp the weapon after the interface has set, being accommodated in the imprints produced by the marking screws.

In this embodiment, it is no longer necessary to have two grooved plates which hold the weapon only by its sides and not by its central portion and the base of the butt used to introduce and provide access to the magazine because it is possible to surround from beneath and by way of the lateral sides the portion of the weapon to be gripped and the imprint-marking screws by packing into the stirrup the soft plastics material thus put in place.

After cooling, it is easy to unscrew the marking screws and to unmould the plastics material.

In this case, therefore, the interface is in the shape of a U, matching the U-shape of the stirrups.

Since the mass of expanded thermoplastic material is moist, it is advantageous if the marking screws, which are also in direct contact with this still moist and hot plastics material, are composed of stainless steel.

The invention relates also to a method for using the receiving equipment, in the case of receiving and positioning means in the form of plates; this method is characterised in that

- a mass of thermoformable plastics material is prepared by heating it in order to bring it into the plastic state,
- the thermoformable plastics mass is applied in the pasty state divided into one or more portions to the regions of the weapon to be clamped,
- the weapon is installed between the grooved plates and the assembly is clamped onto the seat,
- when the plastics material has hardened, the interface may be unmoulded and/or tests may be carried out.

The method can be applied also to the manufacture of an interface for weapons that have a complicated shape or that can be dismantled and that do not enable stirrups to be easily used, the method being characterised in that

- a mass of thermoformable plastics material is prepared by heating it in order to soften it and bring it into the plastic state,
- the weapon is installed in the stirrup,
- the mass is applied in the plastic state divided into one or more portions to the regions of the weapon to be clamped,
- the portion of the weapon to be gripped and the imprint-marking screws are surrounded from below and from the lateral sides by packing into the stirrup the soft plastics material thus put in place,
- when the imprint has set, unmoulding is carried out,
- the marking screws are replaced by the clamping screws in the stirrup in order to clamp the plastics interfaces on the weapon for tests, the clamping screws being accommodated in the housings produced using the marking screws.

Those two methods are simple to implement. In both cases, an imprint of plastics material is obtained which is preserved for a series of adjustments and shots for weapons of the same type.

Drawings

The present invention will be described hereinafter in more detail with the aid of the appended drawings in which:

- Figure 1 is a general view of a test bench whose mount is provided with equipment for receiving a small-arm according to the present invention,
- Figure 2 is a perspective view of the receiving means,
- Figure 3 is a side view of a small-arm installed in the receiving means of Figure 2,
- Figure 4 is a top view of a receiving means in the form of a seat provided with two grooved plates,
- Figure 5 is a view of the seat before the interface is put in place,
- Figure 6 is a front view of a plate showing the channels of the vertical and horizontal grooves, this plate being arranged on the spindles of the seat,
- Figure 7 is a side view of the seat provided with the moulding plate,
- Figure 8 shows the same seat as Figure 7 but with the small-arm,
- Figure 9 is a view corresponding to that of Figure 8 with the thermofusible portion put in place around the butt of the weapon,
- Figure 10 shows the closure of the receiving and positioning means around the butt of the weapon,
- Figure 11 is a view analogous to that of Figure 1 of the whole of a test bench whose mount is provided with equipment for receiving a long weapon according to the present invention,
- Figure 12 is a view of an imprint-marking screw,
- Figure 13 is a perspective view of a clamping screw.

Description of preferred embodiments

The present invention relates to equipment for receiving a small-calibre weapon A for a test bench 1 such as that shown in Figure 1. The test bench is composed of a mount 2 which is provided with different azimuth- and sight-adjustment means and which carries two receiving means in the form of symmetrical lateral sliding plates 3, 4 that are to receive two U-shaped stirrups which are themselves symmetrical and which normally receive a long small-calibre weapon in order to lock it in position and test it.

The equipment according to the invention is installed on one of the two lateral sliding plates 3, 4 of the mount 2 and is composed of a receiving means 5 in the form of a seat carrying the weapon A which is clamped at

its butt CR in such a manner as to leave free the lower end EI of the butt CR in order to gain access to the magazine, that is to say, in order to be able to replace the magazine without having to dismount the weapon A, for a series of test shots.

The various means making up the seat 5 appear, in particular, in Figure 2. The seat 5 carries a positioning means formed by two grooved plates 6, 7 which are generally symmetrical in accordance with a plane and which are connected by positioning spindles and by screws 9 (Figure 3). The plates 6, 7 whose grooves face one another are not applied directly against the weapon but against an interface which is moulded on the weapon and which is not shown in Figure 2.

This embodiment is intended very especially for securing small-arms while the second embodiment described afterwards and represented by means of Figures 11 to 13 is intended for long weapons or hip weapons having a complicated shape which may be readily secured using the known means mentioned above.

Figure 4 is a simplified top view of the seat 5 showing a clamping nut 51 and operating handles 52 for screwing the wedges placed in a rail (not shown) of the mount in order to lock the seat 5 in position on the rail of the mount. The seat 5 also comprises two trued-up parallel positioning pins 53, 54 which are to cooperate with the grooved plate 6 applied against the seat 5. The grooved plate 6 comprises a surface 61 which is opposite that 62 on the side where the seat is located and which comprises vertical and horizontal grooves in the form of wide channels.

The plate 7 which is to be placed against the outside of the butt of the weapon according to Figure 3 also has grooves in the form of channels 71 in its face turned towards the inside of the device while the outer face 72 is flat.

Finally, Figure 4 shows the assembly screws 9 whose length is chosen as a function of the spacing (e) which is required between the grooved plates 6, 7 in order to clamp a given type of small-arm, after surrounding the small-arm with a layer of thermoformable material having a thickness suitable, on the one hand, for correctly surrounding and clamping the

butt and, on the other hand, for correctly distributing the pressure exerted by the clamping screws as will be seen hereinafter. Depending on the thickness of the butt and of the plastics material, clamping screws 9 of suitable length will be chosen.

The various steps involved in putting a small-arm in place in the test bench will be described hereinafter by means of Figures 5 to 10.

Figure 5 is a side view of the seat 5 with the two operating handles 52 for locking the seat in position on the rail of the lateral sliding plate of the mount (not shown). This seat 5 comprises the trued-up parallel positioning pins 53, 54 and openings 55 for receiving the screws 9 in order to mould and clamp the interface on the butt with the interposition of the grooved plates. The seat 5 comprises a given number of internally threaded openings for receiving grooved plates 6, 7 having a symmetrical form enabling the equipment according to the invention to be used in the opposite manner, independently of the lateral sliding plate (of the test bench) used and the need to have access to the weapon.

Figure 6 is a side view of a clamping plate (for example, here the grooved plate 6) showing the distribution of the grooves 61 in horizontal and vertical lines. The grooves forming the grid pattern have a clearance angle facilitating the unmoulding of the interfaces. This plate also has the openings 62, 63 for the passage of the trued-up parallel pins 53, 54 of the seat and also three openings 64 for the passage of the screws 9.

This grooved plate 6 is placed on the seat 5 as shown in Figure 7. The weapon A (Figure 8) is then put in place after interposing between the butt CR and the grooved surface of the plate 6 a mass of thermoformable material constituting the interface. This same mass or a different mass is arranged on the other face of the butt CR. In the example of Figure 9, the mass 10 applied below the butt CR is folded towards the front of the butt leaving free the access route to the various members of the pistol, and also the openings for the ejection and introduction of the magazine. After folding the mass 10 of plastics material around the butt, preferably leaving the front free, the second plate 7 (Figure 10) is applied, observing the alignment of the holes for the passage of the clamping screws 9, then the three clamping screws 9 are introduced and the three clamping screws 9

are tightened progressively in order not to push away excessively the still-soft plastics material; finally, the plastics material is left to cool and solidify before unmoulding is carried out. After setting, it is possible either to unmould or leave the weapon in position, carry out tests and then only dismount the weapon in order to place another identical weapon there for tests. The interface(s), that is to say, the masses of plastics material divided into one or more portions, contribute at the same time as the test benches to ensuring the reference position of the weapon in space. This enables the human parameter during test firing to be eliminated, in the case of both small-arms and long weapons.

Figures 11 to 13 show a variant of the invention. This case corresponds to long weapons having a complicated shape or structure which prevents the use of traditional means for securing a weapon with a view to firing an adjusting shot.

Figure 11 shows a general view of a test bench provided with equipment for receiving a long weapon AL. This test bench, like the previous test bench, is composed of a mount 102 provided with various azimuth- and sight-adjusting means. It carries two receiving means in the form of symmetrical lateral sliding plates 103, 104 which are to receive two U-shaped stirrups which are themselves symmetrical, and which receive the long weapon AL in order to lock it in position and test it. As before, the equipment according to the invention is installed on the two lateral sliding plates 103, 104 of the mount 102 and is composed of interfaces which are integrated in the U-shaped stirrups.

Since it is not necessary in this case to have an opening towards the bottom in order to free the base of the butt as in the case of a small-arm, stirrups, for example the stirrup 103, 104 represented in Figure 11, are used. These stirrups are mounted on the lateral sliding plate of the mount 102 by means of clamping nuts which can be tightened with the indexable operating handles 141, 142. Imprint-marking screws 11 like those represented in detailed manner in Figure 12 are mounted in these stirrups at the site of the clamping screws. After the positioning of the imprint-marking screws 11 (with a calculated overshoot limiting their excessive overshooting in the volume of the lower housing of the stirrup) the portion of the weapon to be gripped and the imprint-marking screws are sur-

rounded from below and from the lateral sides with the thermoformable plastics material which has been softened to the pasty state and which is applied by packing. The portion of the weapon to be fastened (not shown) is enveloped in thermoformable plastics material softened to the pasty state. The screws 11 (Figure 12) have a body 11-1 which is preferably terminated by a half-sphere 11-2. Upstream of the smooth body 11-1, there is a threaded portion 11-3 and finally a head 11-4. The diameter of the threaded portion 11-3 and the diameter of the head 11-4 differ in order to form a shoulder 11-5 by way of which the head 11-4 bears against the outer face of the U-shaped stirrup in order thus to limit the penetration distance of the screw 11 into the mass of thermoformable plastics material. This abutment is necessary in order to avoid a reduction in the thickness of material which exists on the wall of the weapon in front of the clamping screw.

The imprint-marking screws project in accordance with an overshoot calculated to avoid any excessive overshooting in the volume of the mass of the interface in order to prevent the clamping screws from coming into direct contact with the weapon. The consequence of that would be to constrain the weapon during clamping rather than to constrain the interface, that is to say, the gripping jaws.

It should also be observed that the imprint-marking screws replace the clamping screws during the stage of moulding the interface. Since the clamping screws have a ¾ spherical head, that is to say, a neck portion constituting an undercut region, it would not be possible to unmould the thermoplastics mass after it had set, with respect to the clamping screws. In contrast, the imprint-marking screws have a hemi-spherical end which does permit unmoulding after the formation of the imprints in the thermoplastic mass.

After thus moulding the interface on the weapon and on the positioning means, such as the imprint-marking screws 11 (Figure 12), the plastics material is left to cool and solidify and then the screws 11 are unscrewed and replaced by clamping screws 12 formed from a threaded body 12-1 terminated at the front by a hemispherical ball 12-2 and at the rear by a knurled wheel 12-3 with a knurled counternut wheel 12-4 for locking (Figure 13).

When the thermoformable plastics material has set, it is possible either to remove the weapon and use the moulded interface to adjust other weapons, or to adjust the weapon.

The imprint-marking screws are composed of stainless steel while the clamping screws are composed of burnished steel. The plastics material used for the interface is polyurethane.

The thermoformable plastics material described above may be replaced by a similar material, especially compact bicomponent epoxy pastes used to secure portions that make up the weapons and that generate high temperatures. What is involved is above all a device according to the invention for long weapons.

It is also possible to produce the thermoformable plastics interfaces on the two stirrups of a test bench. The two interfaces are not produced simultaneously on the stirrups but in succession because one of the stirrups is used to keep the weapon in place while moulding is carried out using the other stirrup. This technique is applicable to long weapons.

According to another feature, the interface may be in the shape of a U, in a single piece or in several pieces depending on the configuration of the weapon. The form in several pieces (multimodular form) facilitates unmoulding and prevents the weapon from being trapped in the interface. This solution is applicable very especially to long weapons.

Furthermore, the solution of thermoformable plastics interfaces is very especially suitable for securing long and semi-long weapons produced from sheet steel or from hollow plastics material which are renowned for being difficult to secure.

According to a variant of the above method, it is possible to mass-produce interfaces starting from the thermoformable plastics interfaces. For that purpose, it is possible in particular to make calculations and machine or to use a method for the injection of plastics material. The interfaces, thus mass-produced, constitute interface gripping jaws. These jaws may be produced from polymers or from composite materials but also from alu-

minium or from steel in order to permit the rapid fastening of a given weapon model on the test and adjusting benches.

In general, the solution according to the invention constitutes an alternative for reducing the time taken to secure weapons to test and adjusting benches.